Molecular Characterization of First NDM-1 Producing Bacterial Strain Isolated from a Clinical Specimen in Tehran

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Background & Objectives: Metalo β-lactamases (MBLs) belong to class B of β-lactamases and are resistance determinants of increasing clinical relevance in enterobacteriaceae. These enzymes can hydrolyze a wide range of β-lactams. Recently New Delhi metalo β-lactamase-1 (NDM-1) has been described in a Swedish patient and consequently has been reported from different countries. The first aim of this study was to detection of multiple drug resistant strains of enterobacteriaceae. In addition, we characterize one strain of *Klebsiella pneumoniae* producing NDM-1.

Methods: A total of 490 enterobacteriaceae isolates collected from hospitals in Tehran. After antimicrobial susceptibility tests, all isolates were screened for production of betalactamases especially carbapenemases by modified hodge test (MHT) and MBL Etest. Detection of gene encoding MBLs and ESBLs was done by PCR using primers targeting blaKPC, blaGES, blaNDM-1, blaVIM, blaIMP, blaSPM, blaTEM, blaSHV, blaCTX-M, blaPER, and blaVEB. PCR amplicons were sequenced in both directions. PFGE used to molecular typing of resistant isolates.

Results: Overall 25 isolates (5.1%) were resistant to meropenem, 13 isolates (2.6%) were resistant to ertapenem, 5 isolates (1%) were resistant to imipenem. Among cephalosporins, 262 isolates (53.4%), 235 isolates (47.9%), 298 isolates (60.8%) were resistant to ceftazidime, cefepime, and cefotaxime, respectively. All of cephalosporin resistant isolates were multiple drugs resistant. NDM-1 detected in a *Klebsiella pneumoniae* strain that was resistant to all tested antibiotics except colistin. This strain was isolated from blood sample of a 45 years old man who hospitalized in a general hospital in Tehran. Determination of MICs confirmed resistant to meropenem (MIC; 8µg/ml) with intermediate resistant to imipenem (MIC; 4µg/ml). MHT and MBL Etest were positive. PCR showed that this strain also contained blaTEM, blaSHV, and blaCTX-M. PFGE showed that NDM-1 producing isolate has no clonal similarity to other carbapenem resistant *Klebsiella pneumoniae*.

Conclusion: This study showed high level antibiotic resistance among enterobacteriaceae clinical strains isolated from hospitals in Tehran. The essential problem concerning NDM-1 positive bacteria is that carbapenems are the main therapeutic option for treating infections caused by multidrug resistant enterobacteriaceae.

Keywords: Clinical Specimen; NDM-1, Klebsiella *pneumoniae*